Speaker: **Jakob Budde, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung**

Title: **Spatial Mode Demultiplexing Measurements for Dynamical Position Estimation**

Date: **Friday, April 24, 13:00 pm (s.t.).**

Place: **Seminar room 915**

Abstract: **Spatial Mode Demultiplexing Measurements for Dynamical Position Estimation**

The estimation of spatial parameters of one or multiple objects is usually done using camera-based imaging. This means that the intensity distribution of the field is measured in the image plane at each camera pixel. The derived image is then used to extract information like position, size, etc., of the objects in the scene. If the parameters are in a range below the diffraction limit of the imaging system they can only be estimated with low precision. Approaching the problem as a quantum parameter estimation task shows that the camera-based method is not an optimal measurement in this regime and does not saturate the quantum Cramer-Rao bound.
Instead, estimates on specific parameters can be directly extracted from the field by measuring the contribution of different spatial modes. This so called spatial mode demultiplexing (SPADE) measurement can often reach the quantum Cramer-Rao and therefore enable subdiffraction resolution.

I present details on the design process of demultiplexing measurements as well as how to use them to track a moving object taking into account experimental imperfections like crosstalk and readout noise.